Feasibility of making price risk management instruments available to oil palm smallholders in Indonesia and Thailand

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Feasibility of making price risk management instruments available to oil palm smallholders in Indonesia and Thailand

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Introduction

The objective of this report is to assess the feasibility of introducing price risk management tools to smallholders growing oil palm in Indonesia and Thailand. This report is organised as follows. In a general introduction to the subject we first provide background information on the agronomics of palm oil trees in order to clarify conditions, restrictions and other relevant circumstances of oil palm cultivation. Next, we present facts and figures on the world oil market, the position of vegetable oils in this market, in particular palm oil. We also show the position of Indonesia, Thailand and other producers in the supply of palm oil. In this section we also present detailed information on the geographical distribution and the distribution by type of producer (smallholder, private and government estates) of area under oil palm and crude palm oil production in Indonesia and Thailand. The introductory section is completed with a discussion of development and volatility of international palm oil prices.

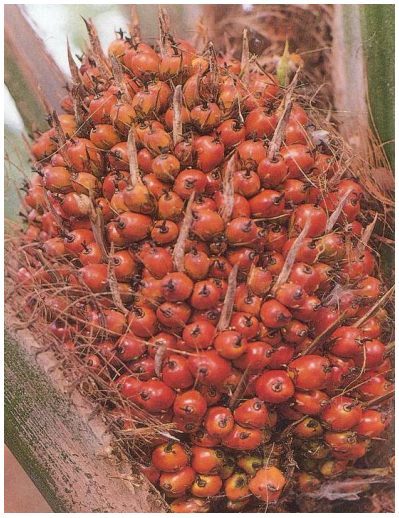
The remaining part of this report considers Indonesia and Thailand separately: first the commodity and marketing chain of palm oil in both countries is discussed. Next we set out how growers' prices of fresh fruit bunches – since this is the output that farmers deliver to traders and processors - in both countries are established. We discuss the exposure to price risks along the marketing chain. Hedgeability of price palm oil price risks is evaluated by calculating basis risk between growers' prices of fresh fruit bunches and prices of palm oil contracts at international futures exchange. Finally we consider a possible transaction to insure the price risk of oil palm smallholders and suggest a number of institutions and organisations that are suitable to implement this transaction.

1 The agronomics of palm oil trees[1]

Oil palms are planted in similar areas as rubber, coconut, cocoa and cassava and are as such competitors for land. Planting density is usually around 143 trees per hectare. It takes 3 to 4 years before the oil palm starts bearing fruit. The subsequent productive stage lasts until the age of 25 to 30 years. Under plantation conditions 20 to 30 leaves are produced annually. In

[1] This section is based on Moll, 1987.

the axel of each leave is a bud, which may develop into a male or a female inflorescence, occurring on the same plant. After pollination the female inflorescence develops into a fruit bunch in 5 to 6 months. A bunch may contain 500-2000 fruits with an individual weight of 3-30 g.



A fruit consists of the outer exocarp (or skin), the mesocarp (or pulp) and the seed, consisting of endocarp (or shell) and kernel. Palm oil is produced from the mesocarp and palm kernel oil from kernels by a subsequent processing technique. The oil content of fresh fruit bunches is generally stated as the oil-to-bunch ratio, which is around 25% for mature palms. The kernel-to-bunch ration is 4-5%.

During the productive stage there are two main types of activities: care and maintenance, and harvesting. Harvesting includes finding and cutting the ripe bunches in cycles of 9-14 days, collecting bunches and loose fruits, loading these into vehicles and transporting them to the mill.

Production is measured in kilograms of fresh fruit bunches (FFB). Yield of fresh fruit bunches per hectare is determined by

- trees per hectare: around 143,
- number of bunches per palm tree, which is declining with age: 15-25 bunches at age 4 increasing to around 10 bunches at age 12 and declining slowly afterwards,
- bunch weight, increasing with age from around 5 kg at age 4 to 20-25 kg at age 14.

- Combining these factors, there is a steep increase in FFB yield per tree to a maximum after 14 years and a gradual decline afterwards to around 70% of this maximum after 25 years.

The next factor in determining the productivity in palm oil production is the oil-to-bunch ratio. This is a product of the following components:

- fruit-to-bunch ratio, depending on the efficiency of pollination: 55-70%,
- mesocarp-to-fruit ratio, depending on the variety: 50-90%,
- oil-to-mesocarp ratio, depending on the ripeness of the fruit: 45-55%,
- kernel-to-fruit ratio: 7-15%.

After harvesting the FFB have to processed within 24 hours to avoid the rapid build-up of fatty acids in the harvested fruit. Processing mills are consequently located close to plantations. A nearby mill is also attractive because the oil and nuts content of the fruit bunches is only 20-30%, adding substantially to the transportation cost per unit of output. Initial investments in processing capacity are, for similar reasons, often combined with investments in plantations. Further expansion of the area under oil palms may subsequently take place through smallholder participation. The need for almost immediate processing after harvesting, the often observed simultaneous investment in a plantation combined processing capacity and the provision of extension services and other inputs to nearby smallholders clearly establishes the CPO processing factory as a strong point of constriction in the commodity chain. Such a point of constriction is attractive from the perspective of enforcing contracts with farmers (see also LMC, 2000): since smallholders hardly have possibilities to sell their FFB elsewhere they have a clear incentive to maintain good commercial relationships with the nearby CPO processing factory.

In the mill the palm fruit is sterilised, mechanically separated from the kernel and pressed in order to extract the crude palm oil (CPO). The resulting product is labelled as clarified and purified CPO. The palm oil content of FFB – the so-called Oil Extraction Rate (OER) – is usually in the range of 17-20%, with higher rates for older trees. The pressing residues are used as fuel and as organic fertiliser. Crude palm oil is a storable product. After drying and bagging, palm kernels are transported to a crushing plant. Crushing palm kernels yields palm kernel oil (40%-45%) and palm kernel meal (55%-60%). Palm kernel

oil is a storable product. The palm kernel meal (or cake) is generally used as feed for poultry and pigs. The chemical composition of crude palm oil and palm kernel oil is different: palm oil contains mainly palmitic and oleic acids, and is 50% saturated, while palm kernel oil contains mainly lauric acids and is 80% saturated. Palm-kernel oil is similar to coconut oil. Both crude palm oil and palm kernel oil is further processed in refineries. A major refining process is so-called fractioning: the oil is transformed into olein (liquid) and stearin (solid). Other operations are refining, bleaching, deoderising, splitting and hydrogenating. After refining, both palm oil and palm kernel oil are further processed into cooking oil or used as raw material for the oleochemical industries producing soaps, lotions, detergents, cosmetics and pharmaceuticals. Palm oil and palm kernel oil are to a large extent interchangeable with other fats and oils.

2 Facts and figures on oils & fats, crude palm oil and palm oil fruit

World market of oils and fats

The world market of oils and fats consists of two major groups, namely vegetable oils and animal oils and fats. The latter group is loosing some ground as can be seen in Table 1. The vegetable oils market consists of a wide range of different types of oil. Among these different types of vegetable oils, palm oil and soybean oil have become the major players, each taking almost a quarter of the fats and oils market and more than a quarter of the vegetable oils market.

The position of Indonesia and Thailand in the world market for crude palm oil

By far the largest producer of crude palm oil in the world is Malaysia, even increasing its share in world production of crude palm oil to over 50% in 2001 (see Table 2). Indonesian production has also grown impressively to a share of over 30%. The remaining palm oil producing countries lag far behind Malaysia and Indonesia and only make a small contribution to world production. Nevertheless, Thailand ranks third in terms of production in Asia and Thailand's production is growing rapidly.

Similar developments are observed for production of FFB and exports of all palm oil products. Shares of production of fresh fruit bunches and export of oil palm fruit

Table 1: Production of oils and fats (x 1000 ton)

	Volume			Percentage share		
	1995	2000	2001	1995	2000	2001
Palm Oil	15,210	21,825	23,355	16.1	19.0	19.9
Palm Kernel Oil	1,945	2,688	2,872	2.1	2.3	2.4
Palm	17,155	24,513	26,227	18.2	21.4	22.4
Soyabean Oil	20,404	25,546	27,779	21.6	22.3	23.7
Cottonseed Oil	3,905	3,852	4,006	4.1	3.4	3.4
Groundnut Oil	4,423	4,573	5,073	4.7	4.0	4.3
Sunflower Oil	8,556	9,677	8,223	9.1	8.4	7.0
Rapeseed Oil	10,955	14,467	13,725	11.6	12.6	11.7
Corn Oil	1,855	1,968	1,962	2.0	1.7	1.7
Coconut Oil	3,350	3,272	3,539	3.5	2.9	3.0
Olive Oil	1,888	2,545	2,690	2.0	2.2	2.3
Castor Oil	483	494	515	0.5	0.4	0.4
Sesame Oil	589	715	751	0.6	0.6	0.6
Linseed Oil	701	698	621	0.7	0.6	0.5
TOTAL VEGETABLE OILS	74,264	92,320	95,111	78.6	80.5	81.1
Butter	5,677	6,026	6,059	6.0	5.3	5.2
Tallow	7,507	8,199	8,196	8.0	7.1	7.0
Fish Oil	1,285	1,416	1,121	1.4	1.2	1.0
Lard	5,692	6,716	6,815	6.0	5.9	5.8
TOTAL ANIMAL OILS/FATS	20,161	22,357	22,191	21.4	19.5	18.9
GRAND TOTAL	94,425	114,677	117,302	100	100	100

Source: Oil World Annual 2001, 2000, 1999, 1998 & Oil World Weekly and MPOB for Malaysia

Table 2 World major producers of palm oil (1000 tonnes)

	Volume			Percentage share		
Country	**1995**	**2000**	**2001**	**1995**	**2000**	**2001**
Malaysia	7,221	10,842	11,804	47.5	49.7	50.5
Indonesia	4,008	7,000	7,480	26.4	32.1	32.0
Nigeria	640	740	750	4.2	3.4	3.2
Thailand	316	525	535	2.1	2.4	2.3
Colombia	353	524	547	2.3	2.4	2.3
Cote D'Ivoire	300	266	275	2.0	1.2	1.2
Papua New Guinea	225	336	325	1.5	1.5	1.4
Equador	178	238	240	1.2	1.1	1.0
Costa Rica	90	113	123	0.6	0.5	0.5
Honduras	76	78	94	0.5	0.4	0.4
Brazil	71	97	110	0.5	0.4	0.5
Venezuela	34	81	84	0.2	0.4	0.4
Guatemala	22	58	70	0.1	0.3	0.3
Others	1,676	927	918	11.0	4.2	3.9
TOTAL	15,210	21,825	23,355	100	100	100

Source: Oil World Annual 2001, 2000, 1999, 1998 & Oil World Weekly and MPOB for Malaysia

products are summarised in Figure 1 and 2. Oil palm fruit products consist of crude palm oil, palm kernel oil, palm kernels and cake of palm kernels. The figures confirm the

Figure 1 Production of oil palm fruit: shares in world production

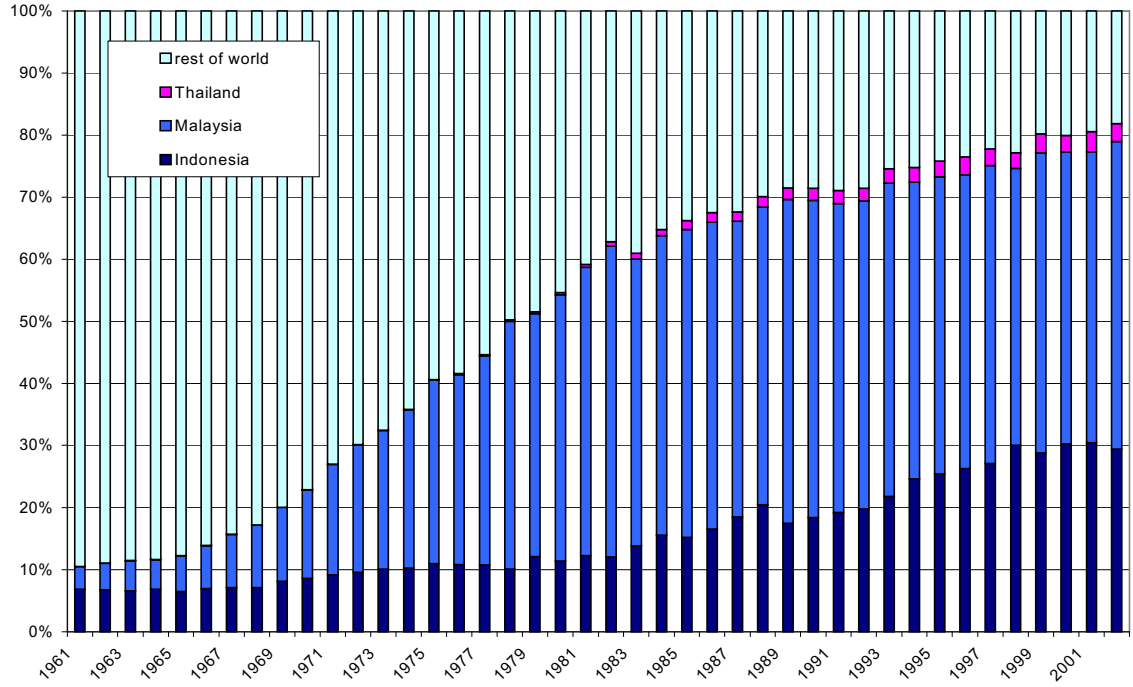
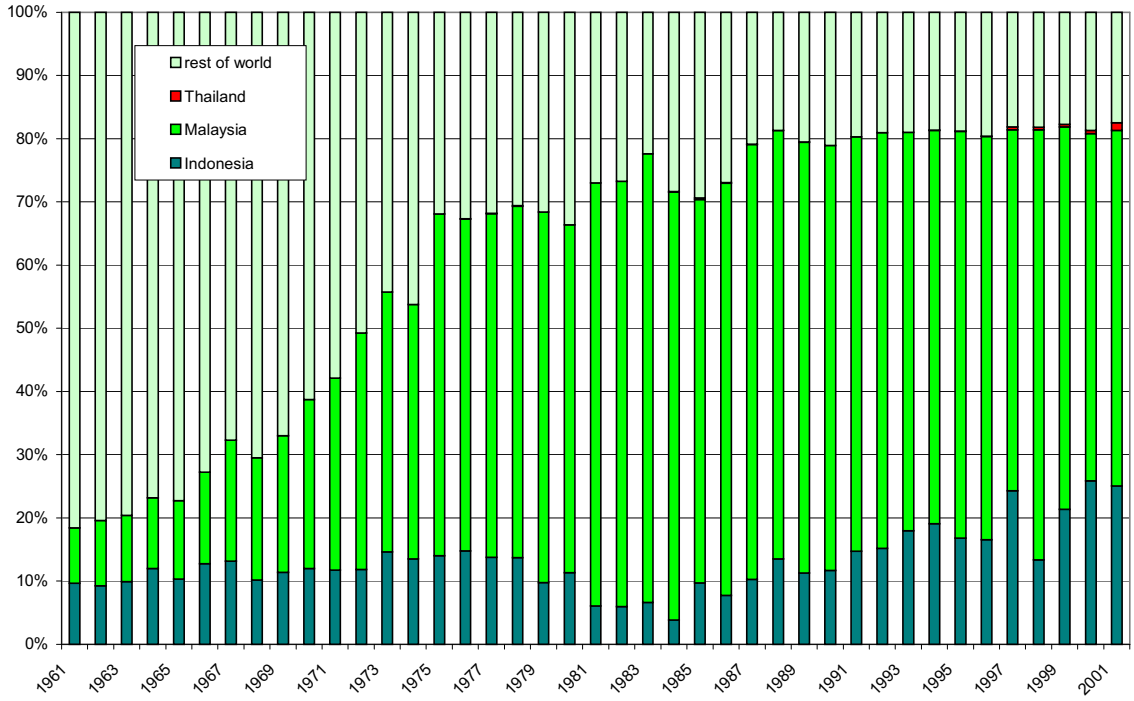


Figure 2 Export of palm oil products*: shares in world export



Source Figure 1 and 2: FAOSTAT

* palm oil products = crude palm oil, palm kernels, palmkernel oil and cake of palmkernels.

dominant position of Malaysia and Indonesia in this sector, and, consequently the relatively modest contributions of other individual countries, like Thailand. The figures also show the development of market shares over time: It appears that the major expansion phase of Malaysia, which has started at the end of the 1960s, has been completed at the start of the 1980s, while the increase of the Indonesian market share began halfway the 1980s, with a slight setback in 1989 and 1990, and is currently still in progress. Some industry specialists on the palm oil sector claim that production of palm oil in Indonesia will overtake production in Malaysia in the near future. Indonesian shares in world export are clearly lower than their production shares indicating that part of production – a larger part relative to Malaysia - is consumed domestically.

There is an issue whether the price formation on the world market is competitive, given these few dominant players. Experiences with natural rubber are in this respect not very comforting: Thailand, Indonesia and Malaysia have agreed upon supply management in case natural rubber prices are low. There are some indications that comparable manipulations may be organised in world palm oil market (Potter, 2001a). Further enquiries are needed to assess this issue in a more detailed way.

Production in Indonesia

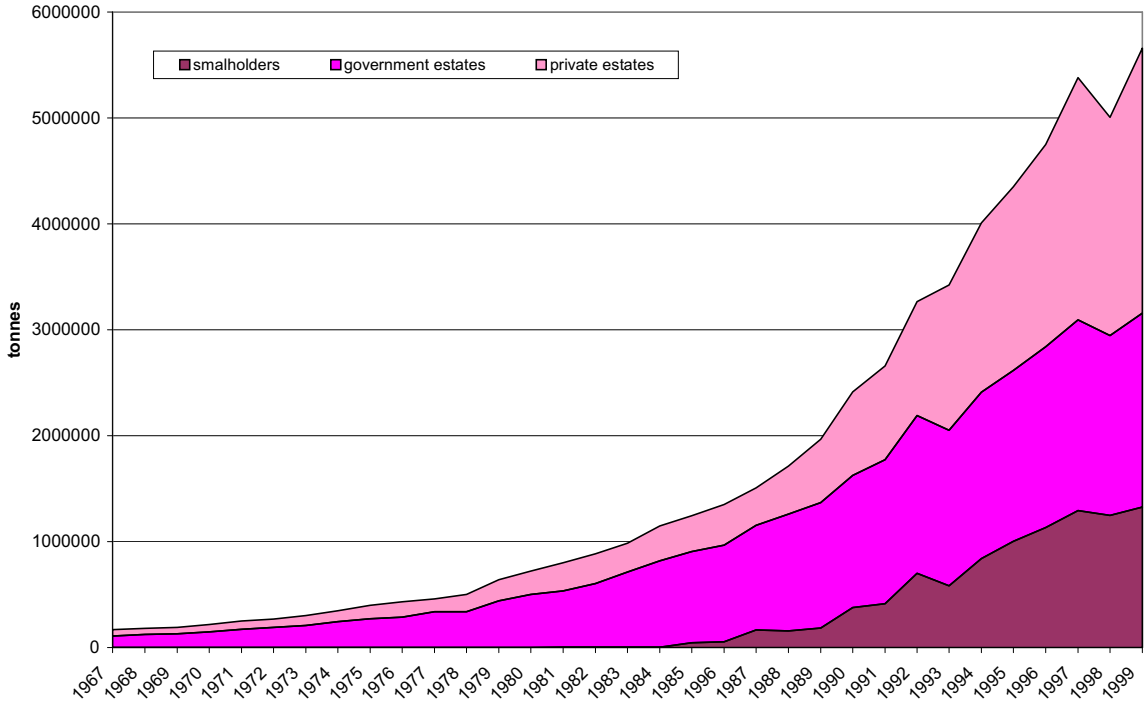
Smallholder involvement in oil palm cultivation was initiated in 1979. The growth of smallholder palm oil area was strongly stimulated by the government with assistance from the World Bank. The scheme applied was PIR/NES scheme (PIR/NES = *perkebunan Inti Rakyat* or Nucleus Estate and Smallholder): under this scheme private developers (known as Inti or Nucleus) prepare land for smallholders (known as plasma farmers) in the vicinity. The smallholders cultivate around 60% to 80% of the plantation area and are obliged to bring their FFB for processing to the company factory run by the nucleus. Plasma farmers have to repay the costs of establishing their estates, including a low interest payment to the company. Repayments start as soon as trees become productive, usually at the age of 3 to 4 years. As plasma farmers are obliged by contract to sell all their fruit to a company factory built at the site, debt repayment is automatically deducted every time fruit is delivered. When the debt is completely paid off, plasma farmers received a certificate from the land

titles office establishing their ownership of the plasma estate. During the establishment phase smallholders are paid for working on the estate and they receive a living allowance. The company also provides extension services and material inputs (on credit). Complete debt repayment of individual plasma farmers takes around 20 years.

In 1986 to 1995 more private sector involvement was encouraged under the PIR Trans Program (KKPA = *Kredit Koperasi Primer Anggota*). In KKPA the government-funded infrastructure facilitated land acquisition, sponsored smallholders (who were largely transmigrants), and provided credit to investors at concessionary rates for estate development, new crop planting and building crushing facilities. The PIR Trans schemes operated along similar lines as the PIR/NES schemes. Like the PTP[2] schemes farmers are obliged to repay the establishment cost of the plasma by exclusively selling fruit to the nucleus company, before they receive a certificate of land ownership. The company must create an oil palm estate along the lines suggested in the PIR scheme and provide capital while a cooperative of (local) smallholders contributes land. The PIR/KKPA scheme is intended to help companies setting up PIR schemes to access bank credit. Private companies commencing projects today are self-funding.

In reaction to limited national resources and the need to make credit available on commercial conditions, the government stopped PIR/NES schemes in August 1995. From then on it focussed its efforts on promoting oil palm development under the PIR Trans/KKPA scheme, where the smallholders are trans-migrants.

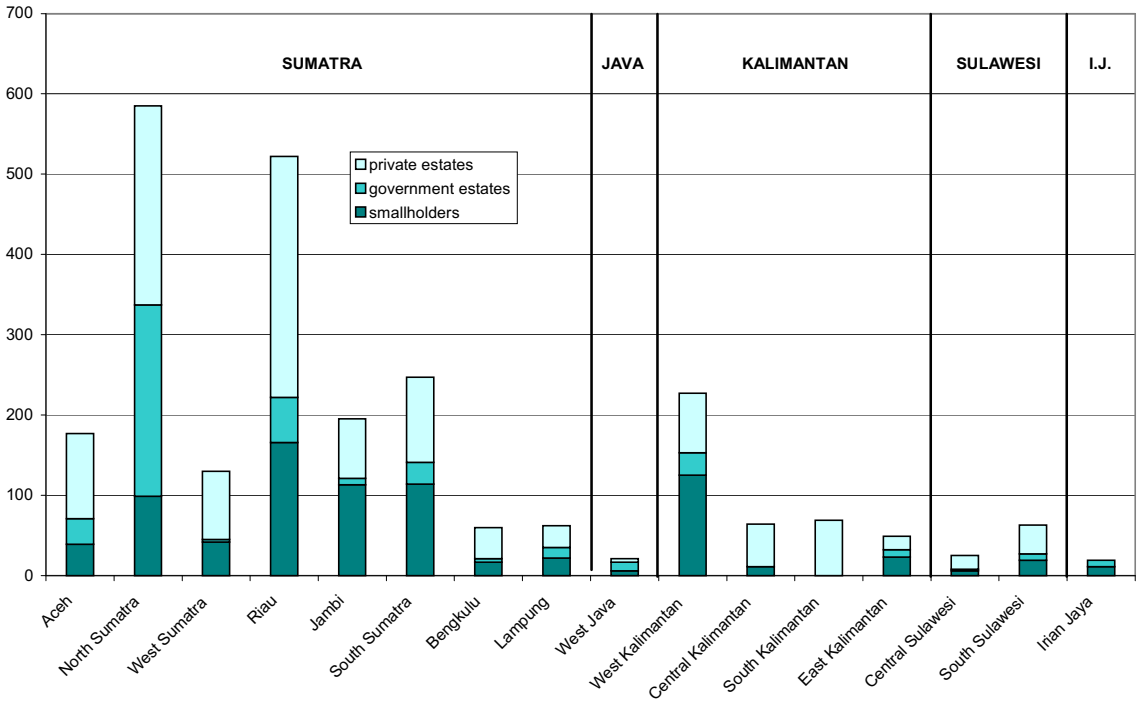
Figure 3 Production of crude palm oil in Indonesia, by type of grower



Harvested oil palm area and production of crude palm oil in Indonesia is concentrated in Sumatra (see Figure 4): 79% of harvested area and 87% of CPO production originates from Sumatra. Production of crude palm oil in Indonesia in 2000 is estimated to total 6.9 million tonnes with a value to the economy of $1.7 billion of which $1.38 billion originates from Sumatra. Within Sumatra, the province of North Sumatra and Riau generate the largest quantity of CPO and have the largest area under oil palm. Traditionally many government owned oil palm plantations and government owned palm oil processing companies are located in the province of North Sumatra.

[2] PTP (or also PTPN) refers to government owned plantations.

Figure 4 Area under oil palm in Indonesia



Almost all provinces in Sumatra are classified as oil palm plantation area and cultivation of oil palm is the most popular estate-based tree planting activity. Private investors and the regional government, two interest groups with considerable influence in determining land use have expanded palm estates in the past years. The most important assistance from the government for establishing plantations has been access to land. Access to land determines the success of all trees planting developments. Regional government officials (*Dinas Perkebunan*) are facilitating the rapid expansion of oil palm plantations.

Production of palm oil by smallholders started only in the late 1970s (see above). Currently around 30% of the area is run by smallholders. Expansion of government estates came to a halt in the late 1990s. Table 3 shows that most smallholder plantations are located in Riau, West Kalimantan, South Sumatra, Jambi and North Sumatra.

Table 3 Area and CPO production by province and category, 1997

	Smallholders		Government Estate		Private Estate		Total	
Province	**Area**	**Prod.**	**Area**	**Prod.**	**Area**	**Prod.**	**Area**	**Prod.**
SUMATRA	612	1,005	381	1,638	985	2,125	1,977	4,768
Aceh	39	35	32	70	106	223	177	328
North Sumatra	99	256	238	1,121	248	905	585	2,281
West Sumatra	42	46	3	16	85	157	130	218
Riau	166	389	56	252	300	545	522	1,186
Jambi	113	148	8	29	74	78	195	256
South Sumatra	114	109	27	101	106	144	247	354
Bengkulu	17	18	4	5	39	56	60	79
Lampung	22	4	13	44	27	17	61	66
JAVA	6	14	11	12	4	7	22	33
West Java	6	14	11	12	4	7	22	33
KALIMANTAN	159	195	37	115	213	126	409	437
West Kalimantan	125	143	28	100	74	53	228	295
Central Kalimantan	11	8	0	0	53	24	63	33
South Kalimantan	0	0	0	0	69	37	69	37
East Kalimantan	23	44	9	15	17	12	49	72
SULAWESI	25	43	10	21	53	27	88	91
Central Sulawesi	6	13	2	0	17	7	25	20
South Sulawesi	19	30	8	21	36	20	63	71
IRIAN JAYA	11	36	8	15	0	0	19	51
TOTAL	813	1,293	449	1,800	1,254	2,287	2,516	5,380

Production in 1000 tonnes and area in 1000 hectares.
Source: Departemen Pertanian Direktorat Jenderal Perkebunan (1998)

Currently private investors and companies are the primary force driving oil palm growth in Sumatra, but the smallholder sector contributed to rapid production growth of oil palm production. Many of the private companies setting up oil palm plantations appear to be subsidiaries of larger conglomerates with diverse interest, including logging. The estates (private estate and government estate) usually consisted of 2 components: a nucleus plantation (pure plantation) and plasma (smallholder) plantations. Some companies are expected to develop entirely company-owned estates with no plasma component. This is made possible by converting forest land with no previous claimants. These schemes will only involve local people as labourers. The government has emphasized that all estates must establish a 'partnership' (*kemitraan*) relationship with local suppliers, but this is a broad, unenforceable concept which does not specify standards that must be followed by companies.

Production in Thailand

Oil palm farmers in Thailand are mostly found in the South of the country (see Table 4; note that production in this Table refers to fresh fruit bunches (FFB).). The major producing province is Krabi, followed by Surat Thani en Chumphon. These three provinces together account for around 43% of harvested area and production. Other important provinces are Satun and Trang.

Table 4 Area and FFB production by province, 2000

	harvested area (ha)		production (tonnes)	
	Hectare	share in %	tonnes	share in %
CENTRAL PLAIN REGION	9,068	4.2%	118,404	3.6%
Rayong	331	0.2%	3,750	0.0%
Chon Buri	2,988	1.4%	34,531	1.1%
Prachuap Khiri Khan	5,749	2.6%	80,123	2.5%
SOUTHERN REGION	208,037	95.8%	3,137,674	96.4%
Chumphon	43,225	19.9%	635,146	19.5%
Ranong	985	0.5%	14,794	0.5%
Surat Thani	61,705	28.4%	944,824	29.0%
Phangnga	1,335	0.6%	19,101	0.6%
Krabi	79,308	36.5%	1,222,448	37.5%
Trang	8,242	3.8%	115,030	0.4%
Nakhon Si Thammarat	616	0.3%	9,090	0.0%
Songhkla	1,679	0.8%	23,659	0.7%
Satun	10,731	4.9%	151,493	4.7%
Yala	13	0.0%	131	0.0%
Narathiwat	199	0.1%	1,958	0.1%
THAILAND	217,104		3,256,078	

Source: Agricultural Statistics of Thailand, 2000/2001

Around 90% of the farmers are smallholders covering 55% of the palm oil area. The remaining 10% of the farmers concern estate holders that cover 45% of the oil palm land. The average palm oil area of a smallholder is around 30 rai. Aggregate palm oil area has increased rapidly during the last ten years: it doubled as can be seen in Table 5, thus making it a popular plantation crop. An important reason is that palm oil is not as labour intensive as rubber. Note that production in this Table refers to fresh fruit bunches (FFB).

Table 5 Area, production and farm gate prices, 1991-2000

	Planted area (1000 ha)	Harvested area (1000 ha)	Production (1000 tonnes)	Yield per ha (kg)	Farm price (Baht/kg)	Farm value (million Baht)
1991	153	108	1,316	12,242	1,77	2,329
1992	160	113	1,352	12,018	1,76	2,380
1993	161	139	1,827	13,160	1,70	3,106
1994	169	145	1,923	13,262	1,82	3,500
1995	175	153	2,255	14,723	2,05	4,623
1996		171	2,688	15,765	2,02	5,430
1997		183	2,681	14,664	2,17	5,818
1998		188	2,465	13,100	3,37	8,307
1999		208	3,512	16,912	2,20	7,726
2000		217	3,256	14,993	1,66	5,405

International price development of palm oil

Since growers' prices are expected to follow prices on the world market, the development of world market prices over time is a key feature to be investigated. Major world market prices for palm oil, namely Crude Palm Oil (CIF, NW Europe and Malaysia), Palm Kernel Oil (CIF, Malaysia / Rotterdam), are shown in Figure 5a to 5c. In Figure 5a price developments in US $ are shown. The same series, but transferred into Indonesian Rupiah and Thai Baht respectively are shown in Figures 5b and 5c.

All figures show large variations of prices. The Asian crisis is most clearly visible in the development of prices in Indonesian rupiah, but it is likely that the price developments expressed in Thai Baht and – in an inverse way - the price developments expressed in US$, are also affected (for a treatment of the relationship between exchange rates and international commodity prices, see Gilbert and Zant, 2002).

Price risk is reflected in the degree of variation of prices. To what extent do these world market prices vary? Calculated over periods of 3 to 5 years, maximum prices are 1.5 to 6 times as high as minimum prices. A more formal quantification of volatility is given in Table 6, where volatility of prices according to a number of widely used measures[3] is shown. Even if we restrict the calculations to observations from 1975 to 1996, and hence skip the observations from the period of the Asian crisis, the coefficient of variation of Indonesian prices is twice as high relative to Thai prices or prices in US $. Comparison of

[3] The squared coefficient of variation is calculated as $CV(P)=VAR(P)/(AVERAGE(P)^2)$ and is widely used as an indicator of volatility as it is dimensionless; the variance of the relative change is another widely used

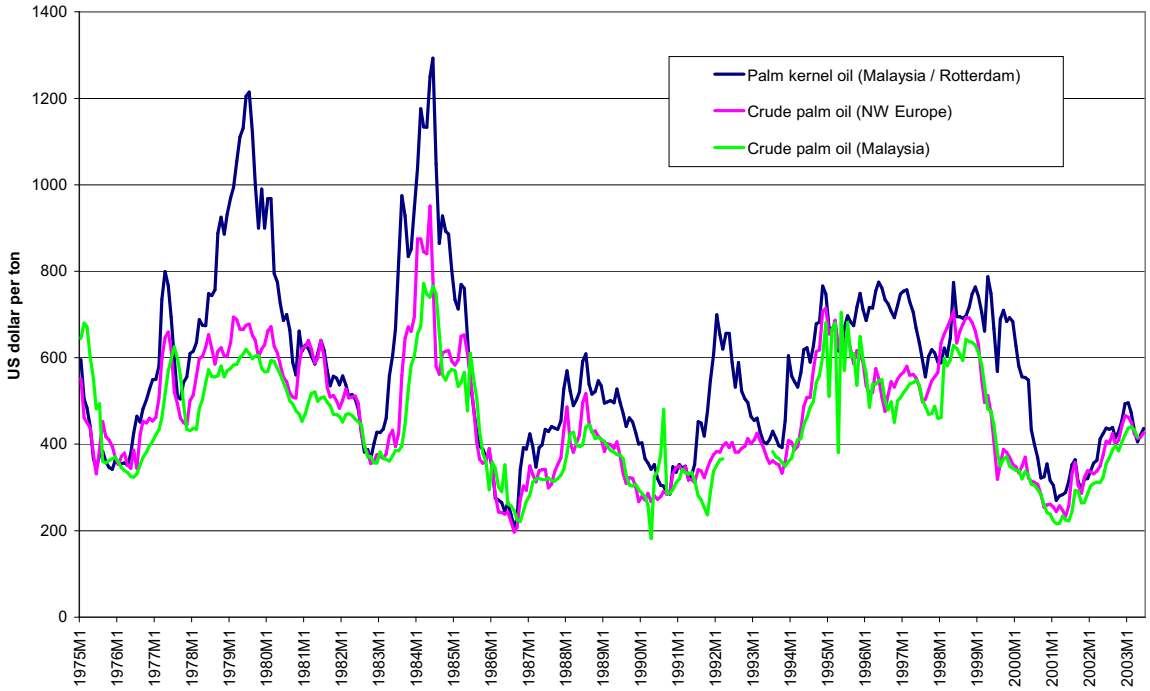
the size of volatilities of crude palm oil and palm kernel oil prices with price volatility of other commodities makes clear that the CV for Indonesia belongs to the higher volatilities, while the other CV are in the medium range.

Table 6 Price volatility of (crude) pal oil and palm kernel oil by various measures
(nominal, monthly prices, January 1975-December 1997)

	Palm Kernel Oil (CIF, Malaysia / Rotterdam			Crude Palm Oil (CIF, NW Europe)			Crude Palm Oil, (CIF, Malaysia)		
	US$	Indonesian rupiah	Thai Baht,	US$	Indonesian rupiah	Thai Baht,	US$	Indonesian rupiah	Thai Baht,
CV	36,0%	63,5%	34,4%	28,7%	64,6%	29,2%	26,5%	65,8%	27,1%
VAR-RD	0.8%	1.5%	0.8%	0.6%	1.4%	0.7%	1.3%	1.8%	1.3%
5MA-MAPD	28.1%	34.3%	27.0%	20.3%	24.4%	19.3%	18.6%	22.2%	18.0%

CV = coefficient of variation; VAR-RC = variance of relative changes; 5MA-MAPD = absolute percentage deviation from 5 years moving average. Source: own calculations

Figure 5a International prices of palm oil (US$)



measure (VAR-RD), as well as the average of the absolute difference for a 5 year moving average (5MA-MAPD)

Figure 5b International prices of palm oil (Indonesian rupiah)

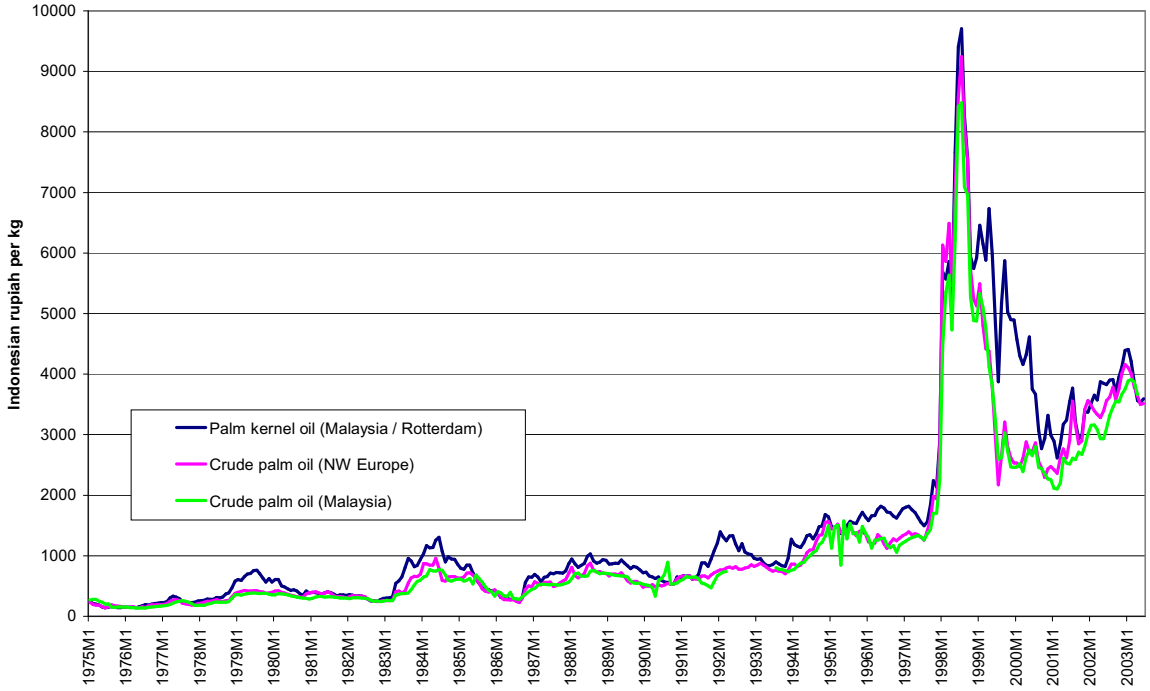
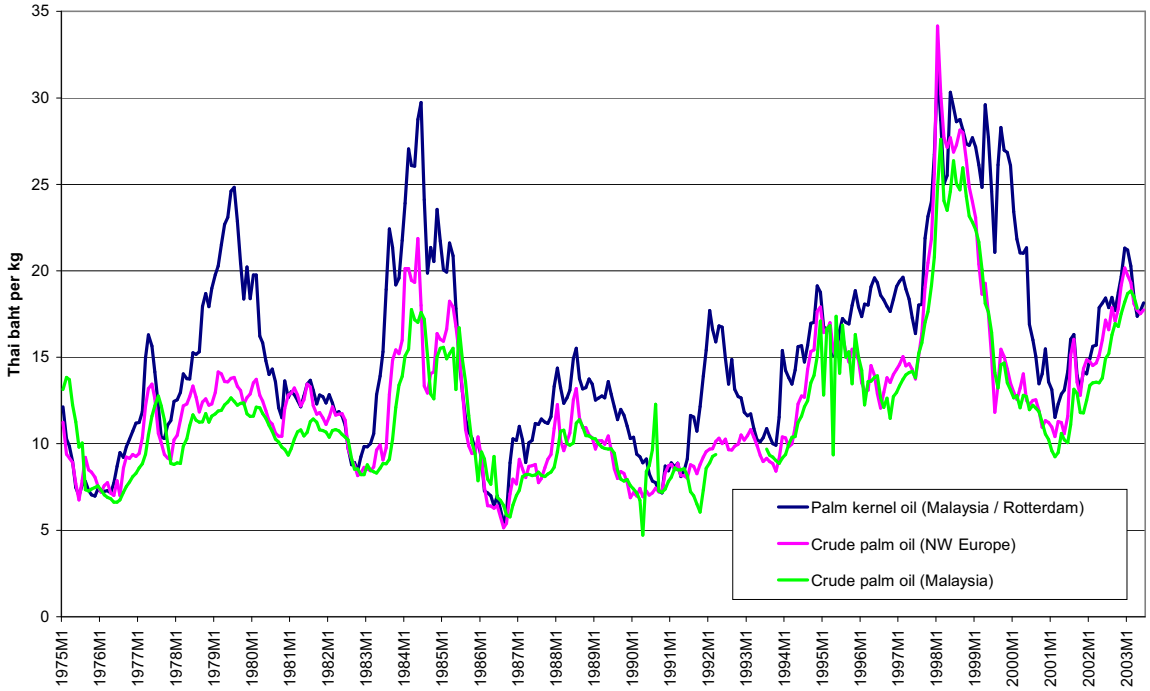


Figure 5c International prices of palm oil (Thai Baht)



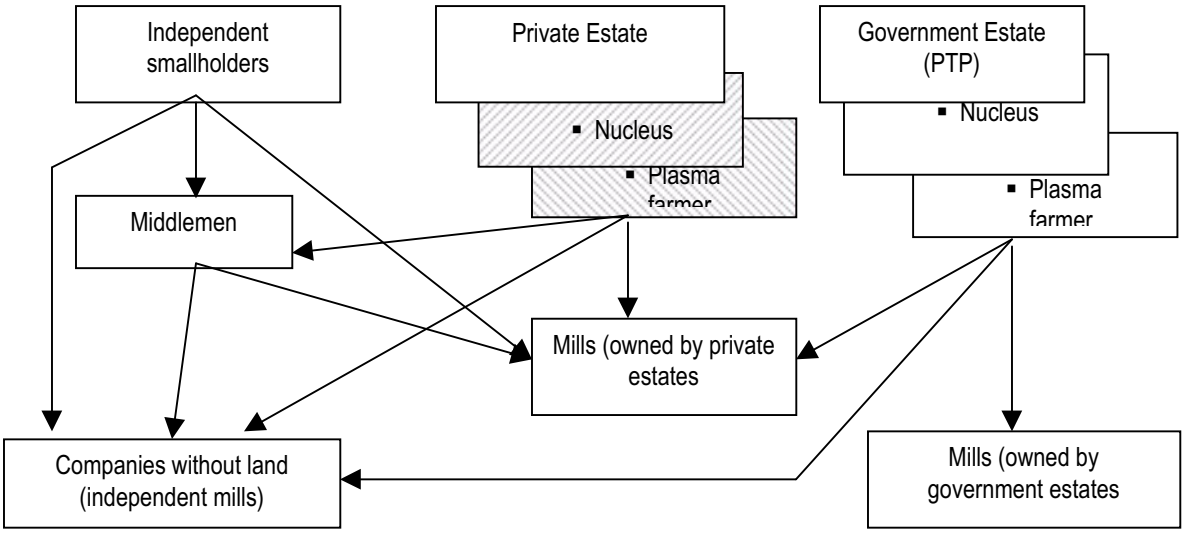
Source of Figure 5a to 5c: International Financial Statistics, IMF

3 The commodity and marketing chain of palm oil: processing palm fruit and marketing, trading & exporting CPO

Indonesia[4]

Figure 6 shows the marketing channels of FFB. Independent farmers can market their FFB either by selling it to middlemen traders or by selling it to processors (which are private companies either with or without land/estate). Independent farmers have more flexibility in selecting a marketing channel to sell their FFB. Actual choices are mainly motivated by transaction prices. The number of independent farmers the size of their cultivated land varies between provinces[5]. Average land ownership for independent farmers is higher compared to plasma farmers.

Figure 6 Marketing Channels of fresh fruit bunches



The figure shows that plasma farmer of government companies (PTP) and private companies has to sell their FFB to the plant. The nucleus is also obliged to purchase the FFB from plasma farmers but the FFB quality must be suitable to the nucleus's standards.

[4] Contributions from Tinjung Mari Prihtanti, Faculty of Agriculture of Satya Wacana Christian University at Salatiga to this section and the section on price formation are kindly acknowledged.

[5] In Jambi province 4% of all smallholders (2,823 out of a total of 70,331 smallholders (2002)) is independent, and they have around 15% of the crop area. In Riau there are 47,000 such farmers, occupying 26% of the crop area.

In practise the plasma farmers may sell their FFB to other CPO processors or middlemen. Selling FFB from plasma to middlemen or independent private mills takes place when the middlemen or independent private mills offer a higher price than the nucleus. On some locations plasma farmers are allowed to sell their FFB anywhere if the nucleus operates at full capacity.

In the past the government has provided funding for investments in the palm oil industry, both indirectly by subsidising investment programs and directly by operating mills and estates. In the course of the eighties these para statal companies have been privatised and the government has increasingly shifted to more private sector involvement (see also section on 'Production in Indonesia'). Currently many Indonesian mills mostly combined with estates are privately owned companies are part of a large, often international, conglomerate, engaged in a wide range of activities, in some cases extending to insurance and banking, whose investments are in many cases funded by internationally operating banks (see van Gelder, 2001). Some ten conglomerates dominate the sector. Funding of investments is partly done by Indonesian companies, and partly by foreign companies. Considerable investment has been attracted from overseas, specifically Malaysian companies. After the Asian crisis the financial problems and bankruptcies of these conglomerates, and subsequent takeovers through intermediation of the Indonesian Bank Restructuring Agency (IBRA) has increased Malaysian interests in Indonesian palm oil to an even bigger share of around 54% of area under oil palm (Casson, 2000). Especially during the 1990s domestic and foreign banks have been financing a large part of the expansion process. Among the foreign banks we find banks from Asia, Europe and the United States.

Thailand

Oil palm farmers in Thailand sell their FFB to the mill either directly of through a co-operative. In Krabi and Chumphon co-operatives dominate the supply of fresh fruit bunches. Especially in Krabi co-operatives appear to operate economically well and efficient. In other provinces direct sales from farmer to mill are more common. Farmers will be inclined to decide to which mill to sell depending on the price offered and on the

transportation costs. However, due to the perishable nature of the fresh fruit bunches, selecting a mill is most likely only a theoretical option for most farmers. Mills do not collect FFB from farmers. Apart from organising themselves through cooperatives, farmers are also organised in the Palm Oil Growers Association (POGA) in Krabi. POGA appears to be an important representative institution. The Nucleus Farms System – large farms combining their own farming activities with supplying extension services and processing facilities to neighbouring small holders (see e.g. Larson, 1996) – appears not to be widely practised in Thailand.

Processing of fresh fruit bunches to obtain crude palm oil and palm kernels takes place in mills. In Thailand there are 21 big mills and 25 small mills, most of these privately owned. In Krabi and in Chumphon a co-operative runs a mill. Mills are members of the Crunching Mill Association, with its office in Bangkok. The total capacity of all mills is 8.3 million tons of FFB per year. Current production of farmers is around 4 million tons of FFB per year. This implies a huge over-capacity, which means first that there is competition to obtain the FFB from the farmer. Secondly, efficiency is low and the crunching part of the cost of production per ton is high. The number of mills is high because there are no regulations and many investors jumped on opportunities during the period of high palm oil prices in the 1990s. Crunching mills will deliver their output to refining mills or in some cases they will export for certain combinations of type and destination. Sometimes crunching and refining is combined in one factory. Thailand is not self-sufficient on an aggregate basis. Some palm oil is imported from Malaysia. The Palm Oil Association, an organisation controlled by the government, is officially authorised to import. In addition some unreported imports are likely to take place.

4 Formation of FFB growers' prices

Indonesia

How are prices for FFB established? The government of Indonesia has established a rule for determining FFB prices paid to farmers (Letter Decree of Forestry and Estate Minister No.627/Kpts-II/98, September 11, 1998). The major motivation for this type of price formation is to guarantee a reasonable FFB price to the farmer and also to avoid unhealthy

competition among processors. The purchasing price of fresh fruit bunches by companies is determined by the following formula:

FFB price = K (CPO price x CPO content + PKO price x PKO content)

where

FFB price	= price of fresh fruit bunches at manufacture level paid to farmers (Rp/kg)
K	= share for farmer in %
CPO price	= average price of Crude Palm Oil realised by processing companies on export and domestic sales 1 month before (Rp/kg)
CPO content	= content of crude palm oil in %, also oil extraction rate (OER)
PKO price	= average price of Palm Kernel Oil (Rp/kg)
PKO content	= content of palm kernel oil in %; also oil extraction rate (OER)

All companies are obliged to follow this pricing rule set up by government in each province. There is, however, no formal enforcement of this pricing rule and no institution to control and supervise its implementation. It is not entirely clear how the parameter "share of farmers" (K) is determined. Unlike the other parameters, which are technical in nature or pertain to verifiable transactions, the parameter "share of farmers" (K) offers a clear tool for discretionary (and arbitrary) influences. Price formation of FFB in Indonesia is very similar to the reference price scheme used in Malaysia.

In Riau province, FFB prices are determined twice every month by oil palm farmer associates from each PIR/KKPA, Nucleus Companies, the Province Estate Crops Division (PTPN V) and large private companies that have applied the PIR model[6]. Actual selling prices of these companies, which are usually based on the Malaysia or Rotterdam market, are collected. On the basis of these prices the average selling price of all companies is determined and used to establish a FFB price to be paid to farmers for the coming period. The agreed FFB price forms the basic price for nucleus companies to pay the oil palm farmer. The palm oil processing industry consists of 71 palm oil private companies and PTPN V as palm oil company owned by the government.

FFB prices paid by the nucleus company should in general be similar with and based on the prices announced by the government, while FFB prices at middlemen and

[6] PT. Sinar Mas, PT. Astra Agro Lestari, PT. Surya Bratasena Plant, PT. Asean Agri, PT. Perdana Intisawit

independent mills will vary (higher or lower). In Riau province, at middlemen level, farmers get Rp. 60 to Rp. 100 less than the official FFB price agreed by the local government. The price range depends on distance of harvesting location to the processing company and the weight of the product. FFB that has been selected and split into pieces (*brondol*) will fetch a higher price, ranging from Rp. 500 to Rp. 700. Fieldwork implemented in August 2003 has found price variation paid to farmer as reported in Table 7. The official FFB price that is announced by government for this period is around Rp. 605 per kg.

Table 7 Price Variation of Oil Palm FFB at Riau Province

Official price announced by government: Rp 605 per kg (August 2003)			
Regency	**Sample**	**FFB Price at middlemen level**	**FFB Price at Processor**
	Farmer 1	Rp. 500/kg (weight > 8 kg)	
KAMPAR		Rp. 460/kg (weight < 8 kg)	
	Farmer 2		Rp. 675/kg (weight > 8 kg)
			Rp. 580/kg (weight < 8 kg)
	Farmer 3	Rp. 525/kg (weight > 7 kg)	
		Rp. 450/kg (weight < 7 kg)	
	Farmer 4	Rp. 595/kg (weight > 7 kg)	
		Rp. 490/kg (weight < 7 kg)	
	Farmer 5	Rp. 550/kg (weight > 8 kg)	
		Rp. 475/kg (weight < 8 kg)	
	Middlemen Trader	Rp. 525/kg (weight > 8 kg)	Rp. 625/kg (weight > 8 kg)
		Rp. 450/kg (weight < 8 kg)	Rp. 575/kg (weight < 8 kg)
			FFB split into pieces Rp. 700/kg
	Farmer 1	Rp. 450/kg (weight > 5 kg)	
SIAK		Rp. 400/kg (weight < 5 kg)	
	Farmer 2	Rp. 550/kg (weight > 5 kg)	
		Rp. 450/kg (weight < 5 kg)	
	Farmer 3	Rp. 570/kg (weight > 8 kg)	
		Rp. 475/kg (weight < 8 kg)	
	Farmer 4	Rp. 590/kg (weight > 8 kg)	
		Rp. 450/kg (weight < 8 kg)	
	Middlemen Trader	Rp. 550/kg (weight > 8 kg)	Rp. 650/kg (weight > 8 kg)
		Rp. 425/kg (weight < 8 kg)	Rp. 590/kg (weight < 8 kg)
			FFB split into pieces Rp. 600/kg

Source : primary data (collected in August, 2003)

In Jambi province price formation is organised very similar to price formation in Riau. FFB price is determined twice every month during a meeting between palm farmer associates from each PIR/KKPA, nucleus companies, the Province Estate Crops Division (PTPN VI) and large private companies that apply the PIR model. Again figures on realised

sales and sales contracts form the basis to establish a FFB price to be paid to farmers for the coming period. The agreed price is the basis for payment nucleus companies to oil palm farmers.

Actual prices paid to farmers appear to vary in a similar way, as in Riau province: FFB prices that are paid by private companies range from Rp. 20 to Rp. 50 below the official price. FFB prices paid by middlemen range from Rp. 60 to Rp. 100 below the official price (Nasrulhadi, Province Estate Crops Division staff, personal communication).

In the province of South Sumatra FFB prices are determined once every month. Apart from the different frequency of establishing a FFB price, the procedure to determine the FFB prices is basically the same as in the other provinces. Practically the farmer may receive FFB prices that diverge somewhat from official prices. FFB prices farmers receive from middleman will most likely be 1 - 5% lower than official prices (Azwar (Province Estate Crops Division staff), personal communication).

The officially determined prices in these three different provinces tend to follow each other reasonably well[7]. If anything, 'official' FFB prices in Riau are systematically higher and in South Sumatra lower, while Jambi moves between those prices. The question arises how these differences in growers' price can be explained. The values of the parameters in the price formula (see above) are apparently different for different provinces. Since it may be assumed that world market prices are more or less equal to all processors and exporters, only realised oil extraction rates for CPO and PKO and the "share for the oil palm grower", both "by province" should explain these divergences in prices. Unfortunately we could not verify this empirically.

The difference between actual prices paid to farmers and 'official' prices may be influenced by the local availability of processing capacity relative to the local supply of FFB. The available CPO processing capacity is not keeping pace with the growth of supply of FFB. As a result, price of FFB is under pressure if local processing capacity is fully

[7] We have FFB price data for **three** provinces, covering 2000, 2001 and 2002, and part of 2003. Both average absolute divergences and maximum divergences between these prices are decreasing substantially over these years and have reached low levels recently (absolute divergence <7%; maximum divergence < 13.5%). If prices in these provinces are representative for the whole country, there is a large efficiency benefit to be gained if formation of FFB growers' prices (reference pricing) is implemented on a national level.

utilised. This explains that FFB prices paid by traders or private processors to growers are in general lower. The lack of processing capacity varies geographically: processing capacity is highly insufficient in West Sumatra, Aceh, and Jambi, while it is nearly adequate in North Sumatra (see Susila, 2003). The requirement of a processing facility near to the oil palm plantation suggests that even within these provinces there may be substantial variation in the balance of processing capacity and supply of FFB.

Especially independent farmers are in a difficult position (from Potter, 2001b):

"… The lack of processing facilities is the main problem faced by independent oil palm farmers. In Riau there are 47,000 such farmers, occupying 26% of the crop area. Plantations look after their own smallholders, but have no responsibility towards independent growers. In Kampar district, farmers complained that middlemen gave them only about half the standard price for their palm fruit. It was perceived that there was a need for an association of local oil palm farmers, as well as factories built specifically for their needs (…). In Riau, many are migrants from North Sumatra who have bought land along main and feeder roads, especially in border areas. Some of those settlers near the Riau/North Sumatra border access processing companies in both provinces. When prices rise they sell their product to the highest bidder" (Potter, 2001b).

Thailand

No detailed information on the price formation of fresh fruit bunches could be obtained.

5 Price risk exposure along the marketing chain

Indonesia and Thailand

Major issues with respect to price risk in the marketing chain are: Who bears currently the risk? How are risks currently dealt with? Are their incentives to insure against price risks? What type of price risk can be insured? Who benefits from insurance? What is the size of the benefits to participate in such a scheme? For both countries, we certainly lack the information to investigate these issues properly. More field work needs to be done in this area. A preliminary discussion follows.

Long term risk: replanting and investment in processing capacity

The smallholder who grows oil palms runs a long term price risk and a short term price risk. The long term price risk pertains to the investment costs of establishing a plantation

with oil palm trees, the maintenance costs and, possibly, the opportunity costs in the non-productive stage of the oil palms. In Indonesia the long term price risk is in the past taken over by the government to a considerable extent in the form of an investment subsidy (see section on PIR / NES and PIR Trans schemes). These schemes are currently no longer operational: since only commercial credit is available to smallholders for the purpose of (re)planting of oil palms, the long term price risk needs to be considered as well. It is clear, however, that the currently available financial instruments are not suitable to offset the long term price risk.

The strong dependency of the establishment of new oil palm plantations on processing capacity justifies further discussion of (future) investment by the milling companies, particular in view of the impact of the Asian crisis on the palm oil industry. Expansion of the palm oil industry requires huge investments, since investments in processing capacity should be combined with investments in plantations. Due to the immaturity period of oil palm trees of around three years, substantial costs are made before any revenues from production are obtained. In the past the government has provided funding for investments in the palm oil industry, both indirectly by subsidising investment programs and directly by operating mills and estates. In the course of the eighties these para statal companies have been privatised and the government has increasingly shifted to more private sector involvement (see also section on 'Production in Indonesia'). Currently many Indonesian mills mostly combined with estates are privately owned companies are part of a large, often international, conglomerate, engaged in a wide range of activities. Funding of investments is partly done by Indonesian companies, and partly by foreign companies. Considerable investment has been attracted from overseas. Especially during the 1990s domestic and foreign banks have been financing a large part of the expansion process.

The strong depreciation of the Indonesian rupiah during the Asian crisis had mixed consequences for the Indonesian oil palm companies. Companies selling a large part of their production abroad, experience an increase of their Rupiah revenues, while most productions costs only increased slightly. With extensive borrowing from foreign banks, interest and debt repayment in terms of Indonesian Rupiah increased drastically. Companies with much foreign borrowing combined with a large share of Rupiah sales ran

into financial troubles. The conglomerate structure of many Indonesian palm oil companies has often exacerbated or even initiated the financial problems of these companies, when the collapse of a mother or sister company strongly impacted the position of other firms in the conglomerate (see Potter, 2001a,b; van Gelder, 2001). Also taxing or even banning exports (see also section on taxes below) severely restricted these companies to overcome their financial problems.

As a result of the Asian crisis, the export tax on exports of CPO during a large part of the 1990s[8] and the resulting shake-up in both the palm industry and the Indonesian banking sector, the climate is currently not particularly favourable to further expansion of the Indonesian palm oil industry. Loans by foreign banks to Indonesian palm oil companies have not generated the expected return: many Indonesian companies were not able to pay interest and repay debt in time, many companies were forced to restructure their debts and many foreign banks had to accept write-offs on outstanding loans. Foreign banks are also much less eager to fund new initiatives in the Indonesian palm oil sector.

Short term risk

The short term price risk pertains to all the costs made in the productive stage of the oil palms. The major costs during the productive stage are labour costs of care and maintenance (applying fertilisers and pesticides), labour costs of harvesting (cutting, collecting and loading of fresh fruit bunches) and costs of transportation of fresh fruit bunches to the nearby processing facility. Prices of material inputs like fertilisers and pesticides, but also energy prices (transportation costs) affect total cost of production, and hence increase the (short term) price risk. Applying fertiliser is essential for optimum yields on the poor soils of most producing areas: At times when price are Rp 300 per kg or less smallholders cannot afford to purchase these inputs (see Potter, 2001b).

Smallholders bear the full short term price risk: once (labour) resources and material inputs have been attributed to the cultivation of oil palms a certain revenue from the sales of fresh fruit bunches is required to cover the costs incurred. A price insurance at the start of the season when the major costs are incurred that fixes the price of the end-of-season

FFB sales, would clearly take away uncertainty, and affect investment and production decisions at the farm level.

Smallholders growing oil palm most likely apply standard techniques to deal with the (short term) revenue risk: cutting costs by reducing the use of inputs, by using more family labour instead of hired labour and possibly by taking children out of school; diversification, both within and out of agriculture. Within agriculture diversification may pertain to cultivation of subsistence crops or other crops with a low or complementary revenue risk profile. In periods low returns on commodity crops, illegal logging by Indonesian smallholders is practised since the immediate cash is highly attractive (Potter, 2001a). Diversification out of agriculture could take place in the form of wage labour in manufacturing or services, or self-employment through the establishment of small scale enterprises, possibly a processing or manufacturing activity connected with agricultural output. Precautionary savings are maintained in a variety of forms: storage of finished agricultural products, durable consumer goods, productive assets, livestock, jewellery, or financial savings. The large increase of palm oil prices in term of Indonesian Rupiah, following the fall of the US$ / Indonesian Rupiah exhcnage rate has created a windfall income to the sector, which is possibly also channelled through to smallholders. Most likely some informal mutual insurance arrangement exists, either within the (extended) family, or within the village or local community. Again, without extensive on the spot investigations it is hard to pass judgement on how smallholders growing oil palm currently deal with risk. This also applies to the other issues raise at the start of this section.

Oil palm growers in Indonesia appear to be relatively well off: the incidence of poverty among oil palm growers is low. However, the Asian crisis has increased the incidence of poverty substantially (Potter, 2001a). Credit repayment rates are shown to be much higher for oil palm growers, then for rubber, coconut and tea growers. Evidence indicates that oil palm growers earn the larger part of their total household income from oil palm. This clearly establishes a high vulnerability of these farmers to price or yeld shocks. Evidence also indicates that the major asset of oil palm growers is their estate and their

[8] Including the ban on CPO exports during some months in 1998

house. Among the more liquid assets, transportation vehicles are a major component (see Susila, 2003).

Processors also bear the full short term price risk, from the moment of purchasing the fresh fruit bunches from the smallholders till the moment of selling crude palm oil, palm kernel oil or palm kernels, either in the domestic market or in the export market. It is believed that processors and exporters are reasonably well equipped to hedge this price risk adequately or to design fixed price forward contracts that substantially reduce price risk.

6 Basis risk between domestic prices and international prices

If price insurance is supplied to farmers, the intermediary providing the insurance assumes the price risk of these farmers. In order to keep the costs of the insurance low, the intermediary could offset this risk on a commodity futures exchange. This may be implemented either directly by the intermediary or through intermediation of a wholesale provider. Whether hedging of price risks offers sufficient reduction of risk depends on the development of local prices relative to the development of the prices on the commodity futures exchange: the producers' price must move in a similar way to those of international prices, or in other words "basis risk" needs to be low.

Palm oil contracts on international futures exchanges

The Malaysian Derivative Exchange (MDEX), based in Kuala Lumpur, is considered the major commodity exchange for crude palm oil. The major trade volume on MDEX is made on futures up to 3 months ahead, with a clear peak in the trade volume of 2 months ahead futures. Liquidity in trade of longer term contracts (further than 3 months ahead) is negligible. Figure 7 shows the trade volume by contract, and Figure 8 shows open positions by contract, both for the years 2000, 2001, 2002 and (partly) 2003. Next to differences in the liquidity of the different contracts on MDEX the figures show that the volume of MDEX is continuously increasing over these years.

Figure 7 Malaysian Derivative Exchange (CPO): volume of trade by contract

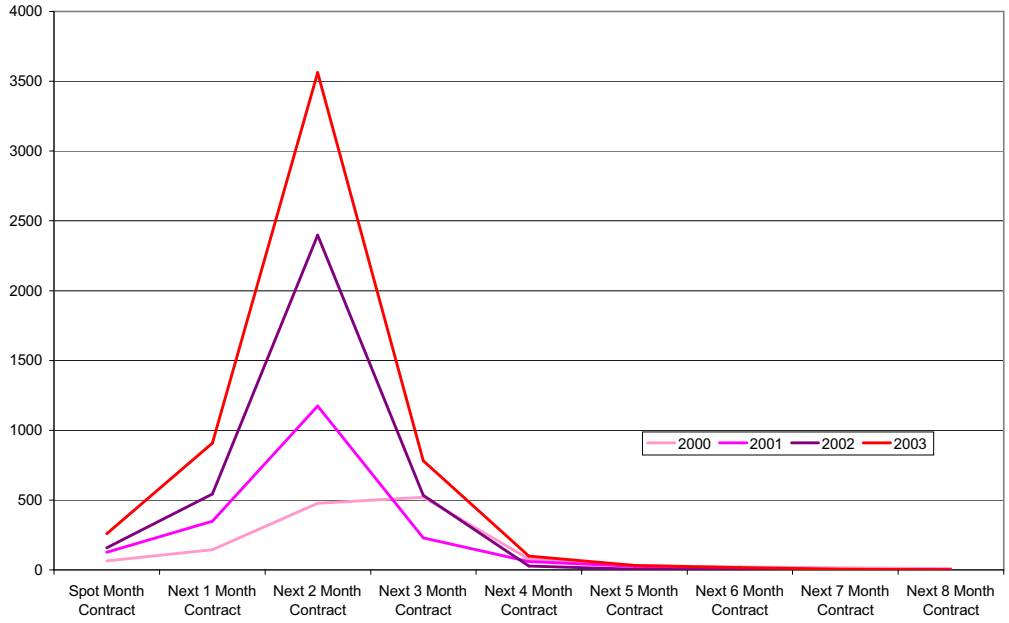
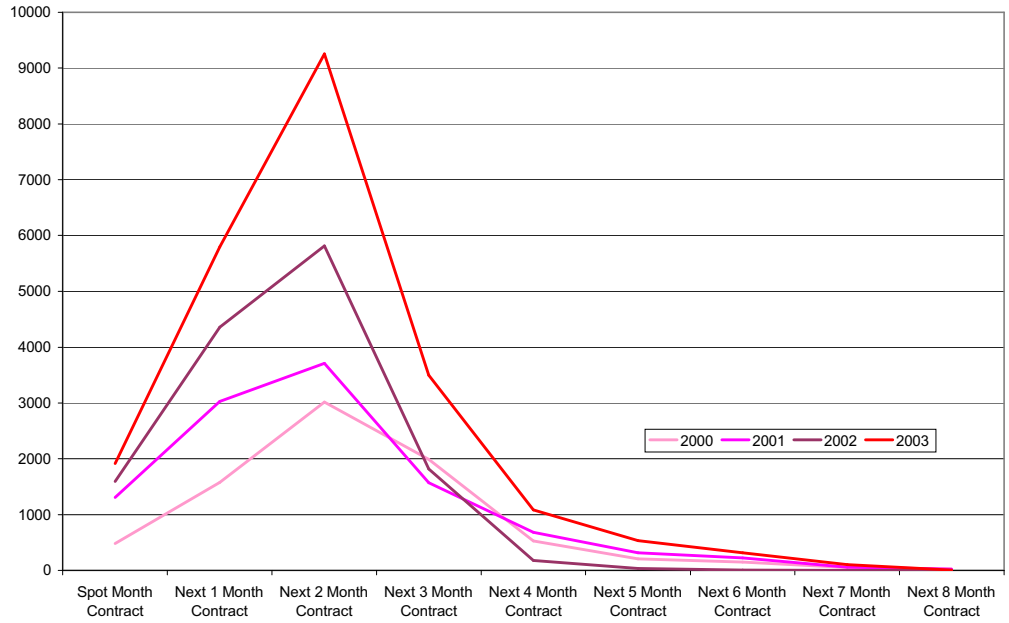


Figure 8 Malaysian Derivative Exchange (CPO): open positions by contract



Exchanges other than the MDEX and futures contracts of other commodities may very well be superior if hedging of palm oil is concerned. Preliminary calculations have

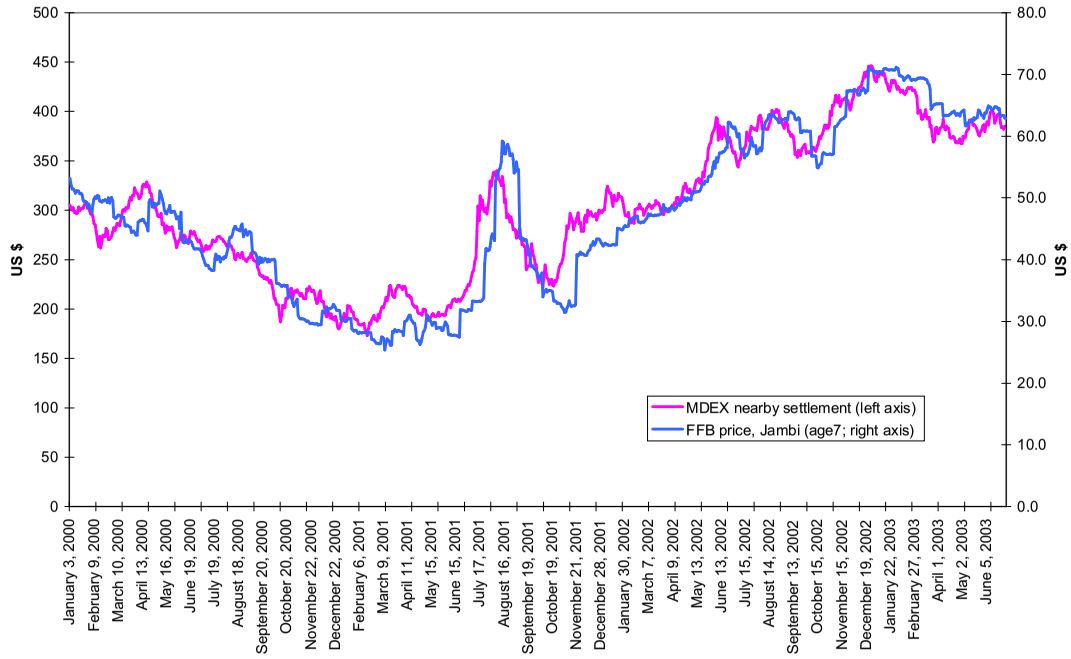
shown that international palm oil prices correlate reasonably well with prices of soybean. This suggests that the soybean oil contract of the Chicago Board of Trade should be considered a serious candidate for hedging palm oil prices (see earlier contribution on this subject, dated 24/10/2002). Liquidity on CBOT will be guaranteed, and this is less certain on MDEX. At this stage we did not investigate further the liquidity issues of MDEX and CBOT, and basis risk between Indonesian FFB prices and CBOT. We have decided to chose the Malaysian Derivative Exchange as the most relevant exchange for hedging price risk of Indonesian and Thai oil palm farmers and we focus on the correlation between FFB prices and MDEX quotations.

Indonesia

Indonesian FFB farmers' prices have been collected for three provinces in Sumatra, Indonesia, namely Jambi, Riau, and South Sumatra[9]. These provinces have been selected since they combine a relatively high share of total area under oil palm and production of CPO, with a relatively high concentration of small holders. The share of area under oil palm in Jambi, Riau and South Sumatra is, respectively, 7.8%, 20.7% and 9.8% (1997), while their contribution to CPO production is 4.8%, 22.0% and 6.6% (1997). Only the province of North Sumatra is larger in terms of area under oil palm and CPO production. However, production in this province is dominated by the government sector. In the province of Jambi close to 60% of area under palm and CPO production is due to small holders. Figure 4 shows the regional distribution of area under oil palm, by type of producer. The figures make clear that area under oil palm in these provinces is either dominated by small holders (Jambi) or has a relatively large contribution from smallholders. In all three provinces exporters and processors agree on FFB farmers' prices on the basis of their selling prices in the most recent past. The selling prices refer to the past 2 weeks and the FFB prices are determined for the 2 week ahead period. Further details on the formation of FFB prices are reported above.

Figure 9 Farmers' FFB price versus MDEX nearby settlement price in Riau

Figure 10 Farmers' FFB price versus MDEX nearby settlement price in Jambi



[9] We kindly acknowledge the work done by Tinjung Mari Prihtanti (Faculty of Agriculture of Satya Wacana Christian University at Salatiga) who collected the Indonesian FFB price data.

Figure 11 Farmers' FFB price versus MDEX nearby settlement price in Sth Sumatra

In summary, we have collected daily data on Indonesian FFB growers' prices for a 3½ year period (January 2000 to June 2003) for the provinces of Riau, Jambi and South Sumatra. Next to growers' prices we have collected daily quotations for the CPO contract at the Malaysian Derivative Exchange for the same period. A first exploration of these data is made in Figures 9, 10 and 11: in these figures we have shown MDEX settlement prices of the nearby contract (US $, left axis of the graph) as well as Indonesian growers' prices converted to US $ (right axis of the graph). From the figures it is observed that growers' prices follow with a lag the MDEX settlement prices of the nearby contract. This reflects the way growers' prices are established (see section on price formation).

With the help of these daily data for a 3½ year period (January 2000 to June 2003) we evaluate basis risk between the Indonesian farmers' prices for fresh fruit bunches (FFB) and MDEX. Basis risk is the risk that prices that need to be hedged, in our case FFB farmers' prices, move independently from MDEX futures quotations for the CPO contract. We measure the basis risk by calculating one minus the correlation between the changes in

the price to be hedged and changes in the futures price against which the hedge is made. Table 8 below summarises the results of the basis risk calculations.

Correlation between Indonesian FFB farmers' price and MDEX is low, and, hence, basis risk is high for short period returns (4 weeks). Basis risk decreases to acceptable levels for longer period returns (12 weeks). The size of the basis risk also appears to decrease and to move to more acceptable levels over the years.

Table 8 Correlation of Indonesian FFB Farmers' prices and MDEX

Riau	4 weeks return	8 weeks return	12 weeks return
1/1/2000-30/6/2003	0.381	0.669	0.734
2000	0.041	0.310	0.449
2001	0.410	0.662	0.677
2002	0.039	0.406	0.543
Jambi			
1/1/2000-30/6/2003	0.415	0.692	0.766
2000	0.041	0.319	0.451
2001	0.442	0.680	0.705
2002	0.201	0.544	0.679
South Sumatra			
1/1/2000-30/6/2003	0.600	0.804	0.843
2000	0.033	0.306	0.398
2001	0.716	0.844	0.824
2002	0.483	0.717	0.755

Source: own calculations

The major reason for this decrease of the basis risk with longer period contracts is the way farmers' prices are agreed upon: these react with a lag on CPO prices and palm kernel prices. The figures showing Indonesian FFB prices in US$ and MDEX nearby settlement prices clearly confirm the lag of growers' prices (see Figure 10, 11 and 12 above). This lag accounts to a large extent for the low correlation in the calculation of the basis risk for short period returns. However, for longer period returns the impact of this lag on the correlation becomes smaller.

With respect to the relationship between FFB price formation and hedging we further note the following. FFB prices are established through a bi-monthly consultation of processors and exporters, in which FFB prices are determined on the basis of their selling

prices in the past two weeks[10]. Most processors and exporters will have a clear idea on how their selling prices compare to the FFB prices that, on average a week later, will be agreed upon and become effective for half a month. As a result these processors know the FFB price, on average, one week ahead of the formal announcement of these FFB prices. Hence, they are also capable to hedge FFB prices, one week ahead. This allows us to incorporate the following modification in the calculation of the basis risk: $P_{FFB,t} = P_{FFB,\ announced,\ t+5}$, where t refers to days with a price quotation. Rerunning the calculations generates the results shown in Table 9. On the basis of Table 9 we draw the following conclusions. Hedging Indonesian fresh fruit bunch prices on MDEX is clearly a feasible proposition, especially since 2001, and for hedging periods of 8 or 12 weeks.

Table 9 Correlation of Indonesian FFB Farmers' prices and MDEX

Riau	4 weeks return	8 weeks return	12 weeks return
1/1/2000-30/6/2003	0.589	0.787	0.821
2000	0.229	0.464	0.621
2001	0.642	0.802	0.790
2002	0.351	0.615	0.713
Jambi			
1/1/2000-30/6/2003	0.581	0.791	0.836
2000	0.078	0.406	0.537
2001	0.643	0.807	0.805
2002	0.511	0.720	0.814
South Sumatra			
1/1/2000-30/6/2003	0.622	0.762	0.778
2000	0.506	0.625	0.531
2001	0.706	0.852	0.837
2002	0.583	0.754	0.809

Source: own calculations

In general the basis will improve substantially if CPO processors decide to increase the frequency of establishing FFB prices (e.g. from once every 2 weeks - which is currently the case - to once every week). Hedging for 8 and 12 weeks periods offered a risk reduction ranging from 60% to 70% (the square of the correlation coefficient).

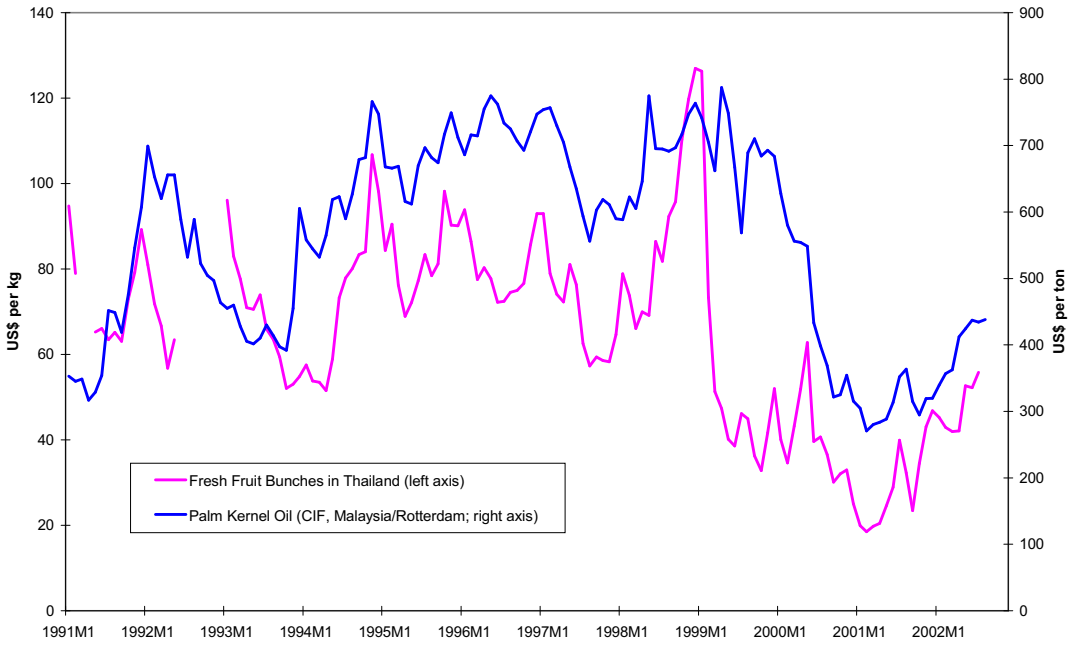
[10] Consultations in South Sumatra take place on a monthly basis (see also section on price formation).

Thailand

Farm gate prices for Thailand are collected from crunching mills by the Office of Agricultural Economics (OAE) of the Ministry of Agriculture and Co-operatives (MOAC). Monthly prices FFB prices converted to US $ are presented in Figure 7a and 7b, combined with international palm kernel oil and palm oil prices. Visual inspection of the data confirm, that Thai farm gate prices of fresh fruit bunches (FFB) tend to follow world market prices of crude palm oil.

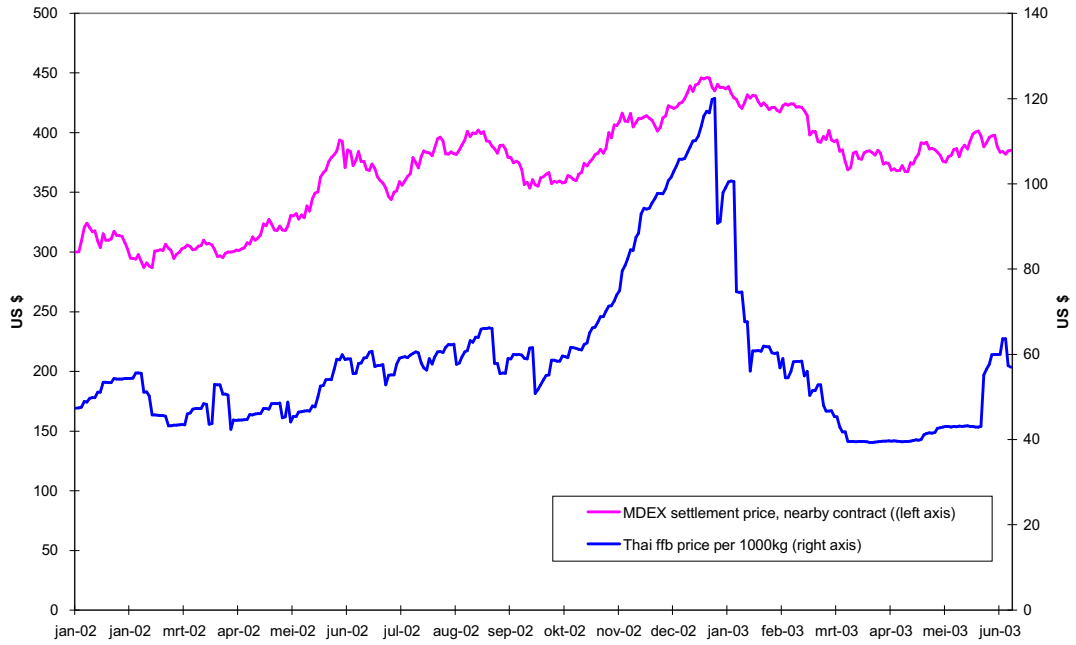
Figure 12a Thai FFB growers' prices and international palm oil prices

Figure 12b Thai FFB growers' prices and international palm kernel oil prices



It is our intention to perform basis risk calculations for Thailand similar to those reported for Indonesia. To do this we need daily FFB prices for a sufficiently long period: however, it appeared to be difficult to obtain these data. We could only secure daily FFB data for Thailand for a period of 18 months. Figure 13 shows MDEX settlement prices of the nearby contract (US $, left axis of the graph) combined with the Thai FFB growers' prices converted to US $ (right axis of the graph). The lack of correlation of these prices suggests a high basis risk. However, the short time span of data does not allow a conclusive statement on the size of the basis risk for Thai oil palm growers. More daily data are required for assessing the size of this risk.

Figure 13 Thai FFB growers' price versus MDEX nearby settlement price



7 Import and export taxation

Indonesia

A large part of CPO production in Indonesia is sold on the domestic market. The main use of CPO in the domestic market is as raw material for cooking oil. In order to control domestic supply and price of CPO and cooking oil, various measures have been taken by the government. The major policy tool to control domestic supply is by imposing a tax on exports[11]. Export tax on crude palm oil and related products has been introduced as early as 1994, in various levels. For a period of several months in 1998 (January, February, March) the government of Indonesia has banned CPO exports. When international CPO prices peaked at a level of USD600/ton and higher, there was shortage of CPO in the country. At that time the domestic price of cooking oil was very high. These circumstances motivated the government to ban CPO exports or to impose a high CPO export tax (up to 60%) to prevent exportation of CPO. This policy intended to maintain the stock of CPO in the country for the cooking oil refineries. It is widely believed that this policy has been

[11] Larson (1996) also mentions buffer stock operations and direct sales from public estates. Since we lack up-to-date information on this, it is difficult to pass a judgement.

effective in controlling supply and price of cooking oil. The policy has caused a substantial welfare shift from oil palm growers and CPO processors to consumers and the government. However, with the tiny share of expenditure on cooking oil in the average Indonesian household budget, even an extreme price increase will hardly be a burden for consumers (see Larson, 1996). Investment of oil palm growers, production of oil palm growers and revenues from FFB are all adversely affected by the policy, simply because higher export tax drags down the growers' price of FFB.

Since February 1999 the export tax rate has decreased continuously to a level of 10% during the last half of 1999, 5% in 2000 and up to March 2001, and 3% since March 2001. The current level of export tax is 3% on Export Base Price of USD 160/ton. This base is adjustable by government depending on international CPO price and availability of CPO stock in the country. The industry expects the export tax to be lifted in the future. It is unclear, however, if this expectation reflects a perceived acceptance of Indonesian policy makers that the cost of such a policy are high and the benefits are small, or, if this expectation pertains to the expectation of processors that CPO prices in the near future will not exceed the trigger price for increasing the tax rate on exports. Industry specialists recommend that a consistent policy is a minimum requirement for an investment friendly development of the CPO sector. A tax rate on export at a low level (<5%) that is constant for a certain period (say 5 years) also appears compatible with price risk management, and hence with insuring FFB prices of oil palm growers.

Thailand

Prices in Thailand are said to be higher than in Malaysia. It was mentioned that in 2002 an import tariff existed of 20%. This will go down to 5% in 2003 and will disappear shortly after. Because of illegal imports this import tariff is not really relevant. Prices in Thailand and Malaysia are coming closer with the difference being determined by the tariff and by transportation cost.

8 Price insurance and agricultural credit: further aggregation of transactions

Introduction

Providing price insurance to small farmers requires an institution in the country that is capable of dealing with farmers. Practically this institution should be organisationally and administratively equipped to sell insurance to farmers insurance and, subsequently, to act as an agent to collect insurance premiums and distribute possible insurance pay-out. It is often suggested that the company, organisation or institution that is particularly suitable for this task should deal with farmers in some line of business, so that the provision of insurance is mainly including another service to an already existing package of services. An appropriate intermediary should have an extensive network combined with a high penetration among farmers. Potential intermediaries include financial institutions, co-operatives, and processors/exporters/ traders.

There are basically two approaches for the process of transmission, and thus for the type of intermediary. The intermediary by its very nature is involved in buying output from farmers. In this case one may think of cooperatives or processors. In this case the intermediary will guarantee the insured price to the farmers. But then the intermediary also wants to be sure that the farmers sell to the intermediary if the market price is above the insured price. Palm oil is a case where such might be more easily reinforced, because fresh fruit bunches must be processed within 24 hours of harvesting. This processing is done in rather large factories of which mostly only one will be close to the farmer. This creates a point of constriction that is attractive from the perspective of enforcing price insurance contracts with farmers. This appears to apply for many farmers in Thailand. In Indonesia, where schemes have been applied such as the PIR/NES scheme (Perkebunan Inti Rakyat or Nucleus Estate and Smallholder Scheme), the PIR-Trans programme and the KKPA scheme, appear to offer even stronger points of constriction and less problems with the enforcement of contracts. The second possibility is that the intermediary is a financial institution, providing credit or banking facilities, to oil palm farmers, cooperatives of oil palm farmers or processing companies, or a combination of these.

Indonesia

In Indonesia one bank appears particularly suitable to operate as LTM. Bank Rakyat Indonesia (BRI) is one of the three state owned commercial foreign exchange banks in Indonesia[12] and is currently one of the largest banks in Indonesia. The banking sector has experienced a major restructuring in the course of the Asian crisis and this has also affected BRI[13]. Despite government ownership BRI is fully commercial and competes with other commercial banks on an equal footing. BRI has overseas offices located in Singapore, Hong Kong and New York. However, BRI targets its activities at providing credit and saving facilities to medium and small businesses located both in rural and community areas. BRI has 324 branches covering the entire country. Micro credit programs are implemented by an even larger number of so-called units (close to 4000). The performance of the micro credit is excellent, even during the crisis. This outstanding loan performance should be attributed to repayment schemes that are attuned to the cash flows of clients, to the domestic orientation of clients and to the preference of clients to maintain the BRI credit line. All units offer savings and credit facilities and have their own balance sheet. Enforcement of a large part of repayment is guaranteed through the system of payroll deductions: since payroll deductions are not possible with farmers, the introduction of price insurance combined with credit lines may offer an additional device to improve enforcement. Part of BRI business concerns program loans, i.e. channelling of loans for government schemes, such as those to cooperatives or to the government agency that provides agricultural price support. We may conclude that:

- BRI operates on a commercially sound basis,
- BRI has a large network and a high penetration in the rural areas,
- BRI is involved in micro credit, has experience in the screening of clients for these types of credit, has shown healthy repayment records with well established mechanisms of enforcement.

[12] This section is based on Patten et al. (2001) and the website of Bank Rakyat Indonesia (www.bro.co.id)
[13] During the crisis (1997-2000) the two largest banks were taken over by the Indonesian Bank Restructuring Agency, 61 banks were closed, 11 nationalized to be consolidated for resale, and 7 of the statebanks are merged to 4.

- on the other end of the scale of activities BRI is also involved with international foreign exchange and treasury transactions

The evidence on BRI clearly makes it a potential candidate to intermediate price insurance to palm oil farmers in Indonesia and clearly supports further investigation along these lines.

Thailand

In the earlier mentioned case of natural rubber in Thailand (see Connor et al. 2001) an agricultural retail bank, the Bank for Agriculture and Agricultural Cooperatives (BAAC), was intended to intermediate price insurance to farmers in conjunction with their regular lending to farmers. This should improve BAAC's recovery on loans, reduce the administrative costs associated with recovery and possibly enable higher loan amounts and superior coverage of fixed costs. The advantage for the farmer would be that BAAC could ask a lower premium for the price insurance (or, alternatively, credit on better terms) because of the benefits it will enjoy: improved recovery of loans and lower cost. In Thailand BAAC is the natural retail intermediary because of its extensive network with farming households and agricultural cooperatives; its low delivery cost for financial services; and because it is well-managed with a history of good loan performance.

9 Consumption of palm oil and offsetting risk by multinational companies

The larger part of CPO production in Indonesia is exported. The main destinations for Indonesian exports are the Netherlands (44%), Germany (12%), Italy (9%) and Spain (5%). The large share of the export to the Netherlands is due to the British Dutch company UNILEVER. It appears sensible to investigate if, in what way and to what extent UNILEVER, or in general, the end use industry of the palm oil sector, is interested and prepared to participate in price risk management schemes that aim at reducing price risks for farmers.

In order to highlight a potential role of these companies we elaborate on a hypothetical price insurance scheme. In a possible price insurance scheme, a wholesale intermediary writes and sells OTC put options to an intermediary, for example an

agricultural bank. The palm oil price risk taken by writing puts to the retail intermediary, can be offset by the wholesale intermediary in two ways. The first way pertains to covering the risk by hedging the position on a palm oil futures exchange (i.e. by selling palm oil futures contracts to offset the price exposure on the OTC puts). Otherwise, and this is the second way, the wholesale provider may swap the price risk with a large palm oil end-use industry.

In the latter case the difficulty is that the palm oil end-use industry has to see an incentive to act as counter-party. Swapping risks with end-use companies may be implemented in two ways. The first is that the company can benefit from the premium income from writing puts. The second is that the transaction would take the form of a collar in which the palm oil end-use industry writes a put on the palm oil price, which is intermediated through to the palm oil farmers, but this is paid for by a call. Most probably these end use industries find collar structures, in which they exchange a price floor in favour of farmers for a price ceiling in their own favour, more attractive than sale of puts for premium income. However, in our view, collars are relatively unattractive to farmers, who stand to lose at least part of the benefit of high prices, and to the retail intermediary, which, in the absence of collateral, will face performance problems. There is therefore a potential mismatch between the retail insurance products and the most readily available wholesale products. Whether and to what extent the selected wholesale intermediary will choose to offset its risk position in this way will depend on the suitability and liquidity of the palm oil futures markets, and whether and to what extent it maintains relationships with palm oil end-use industry.

10. Summary and Conclusion

Malaysia and Indonesia are the major producers of palm oil with a combined share of around 80% of world production and export at the turn of the century. Thailand is a small producer of palm oil. Within Indonesia the larger part of palm oil originates from Sumatra (around 80% of area and 90% of production), with increasing shares of private estates and smallholders. Within Thailand oil palm cultivation is concentrated in the south.

The Kuala Lumpur based Malaysian Derivative Exchange (MDEX) is a clear candidate for hedging palm oil price risk. MDEX shows a trade volume in the CPO contract that is continuously and strongly increasing over the years 2000, 2001 and 2002. Volume in CPO futures up to 3 months ahead is quantitatively most important. The soybean contract on the Chicago Board of Trade (CBOT) is another possibility for hedging price risk of palm oil.

Basis risk calculations for Indonesia, using daily data for 2000 to 2002 show that hedging for 8 and 12 weeks periods offered a risk reduction ranging from 60% to 70%. Basis risk calculations for Thailand could not be made due to a lack of adequate data. Visual inspection of the available (monthly) Thai price data suggest correspondence between domestic price of fresh fruit bunches and international palm oil prices, to a considerable degree. No basis risk calculations are implemented using prices of the soybean contract at CBOT.

The need for almost immediate processing after harvesting establishes the CPO processing factory as a strong point of constriction in the palm oil commodity chain. Such a point of constriction is attractive from the perspective of enforcing contracts with farmers. In Indonesia this point of constriction is further strengthened by the practice of simultaneous investment in a plantation combined with processing capacity and the provision of extension services and other inputs to nearby smallholders (nucleus and plasma farmers).

The point of constriction in Indonesian palm oil, however, is not a blessing in all respect. Given the insufficient processing capacity, independent farmers often fail to cash the ‘official price’ and have to make additional (transportation) costs to sell their FFB, or even are forced to leave their crop unharvested. They lack the close relationship with one specific processor and their basis risk is most likely much larger. This is especially worrying, since this group of independent smallholders (as opposed to the plasma farmers associated with a processing plant) is growing, and is also intended to be a major target of the proposed price insurance scheme.

Next to the processing industry, agricultural banks and the end-use industry may play a role in the intermediation of price insurance to oil palm growers. Both in Indonesia

and Thailand an agricultural bank – BRI in Indonesia and BAAC in Thailand - appears to be a potential and suitable candidate to operate as a retail provider of price insurance for palm oil price risk. Also large end-use industries could be interested and prepared to participate in price insurance schemes for oil palm farmers.

The major issues that are currently facing the Indonesian palm oil industry (and not all of these are discussed at length in this report) are the government intervention in demand and supply of CPO (particularly export taxation), the funding of further expansion of CPO and PKO production (availability of private funding in the aftermath of the Asian crisis), the environmental consequences of further expansion (particularly potential deforestation)[14] and the decentralisation of political and administrative power in the post Suharto era. A risk management initiative in the Indonesian palm oil sector should take these issues into account.

References

Casson, A, 2000, 'The Hesitant Boom: Indonesia's Oil Palm Sub-Sector in an Era of Economic Crisis and Political Change, Center for International Forestry Research, Bogor, Indonesia.

Connor, J., C.L. Gilbert, P.Jumpasut, H.Smit, J, Yaron and W.Zant, 2001, 'Assessing the feasibility of transmission of risk management instruments to natural rubber smallholders in Thailand', esi-vu/IRSG/WB, report to the International Task Force on Commodity Price Risk Management, August, 115 pp.

Gelder, J.W. van , 2001, 'Dutch Banks and palm oil and pulp & paper in Indonesia', research paper prepared for WWF International (available on);

Gilbert, C.L. and W.Zant, 2002, "Aluminium Prices: The Influence of Exchange Rates and Interest Rates", report prepared for Landsvirkjun, Iceland;

Larson, D.F., 1996, 'Indonesia's Palm Oil Subsector', Policy Research Working Paper 1654, The World Bank, September.

LMC International, 2000, 'The Use of Market Based Commodity Risk Management

[14] In 2001 three Dutch banks have decided to restrict the financing of the development of Indonesian palm oil plantations, because of the environmental damage (deforestation) of further expansion of plantations.

Techniques in Commodity Dependent Developing Countries: Perceptions, Opportunities, Constraints, Accessibility to Small Scale Producers', report prepared for the European Commission, January.

Moll, H.A.J, 1987, 'The economics of oil palm', PUDOC, Wageningen.

Patten, R.H., J.K.Rosengard and D.E.Johnston jr, 2001, 'Microfinance Success Amidst Macroeconnomic Failure: The Experience of Bank Rakyat Indonesia During the East Asian Crisis', World Development, Vol 29, No. 6, pp 1057-1069;

Potter, L. M., 2001a, 'From the grassroots: the continuing impact of crisis on export crops, farmers and forests in Outer Indonesia' Seminar 'Crisis in Asia, Local, Regional and International Perspectives', February 16-17 Adelaide University

Potter, L. M., 2001b, 'Perennial Crops In Indonesia: Mixed Messages In Changing Times', paper presented at the Conference of the Future of Perennial Crops, Yamoussoukro, Cote d'Ivoire, November 2001;

Susila, W.R., 2003, 'Contribution of Oil Palm Industry on Economic Growth and Poverty Alleviation in Indonesian Economic Recovery', unpublished manuscript;

Zant, W., 2002, 'Basis Risk of Thai Palm Oil Prices', unpublished note to WB/CRM group, 24 December 2002.